

1. What is Business Intelligence? Explain.

Business Intelligence (BI): BI is a tool or a process used to **collecting and analysing data to support business for making decisions**. BI helps in gaining a better understanding of a company's current situation, and provides insight into what best to do in the future.

Business intelligence may be defined as a set of mathematical models and analysis methodologies that exploit the available data to generate information and knowledge useful for complex decision-making processes. **BI can be used to analyse customer buying behaviour.**

Need for Systems Equipped with BI: In complex organizations, decisions are made on a continual basis. Such decisions may have long or short-term effects, and involve people and roles at various hierarchical levels. The ability of these knowledge workers to make good decisions is one of the primary factors that influence the performance and competitive strength of an organization. Most knowledge workers reach their decisions primarily using their experience, knowledge of the application domain and the available information.

The main purpose of business intelligence systems, therefore, is to provide knowledge workers with tools and methodologies that allow them to make effective and timely decisions.

Overview of Business Intelligence:

- ❖ **Effective decisions:** The application of rigorous analytical methods allows decision-makers to rely on information and knowledge which are more dependable. As a result, they are able to make better decisions and devise action plans that allow their objectives to be reached in a more effective way.
- ❖ **Timely decisions:** Enterprises are working in highly dynamic environments with stiff competition. As a consequence, the ability to react rapidly to the actions of competitors and to new market conditions is a critical factor in the success or even survival of a company.

2. Write about Data, Information and Knowledge in BI Systems.

A vast amount of data is accumulated within the information systems of public and private organizations. These data originate from various sources like internal transactions of the company and also from external sources. Gathering and storing all this data in a systematic and structured way is insufficient as this data cannot be used directly for decision-making purposes. Let us understand the meaning and difference between data, information and knowledge:

- ❖ **Data:** Generally, data represent a structured codification of single primary entities, as well as of transactions involving two or more primary entities. For example, for a retailer, data refers to primary entities such as customers, points of sale and items, while sales receipts represent the commercial transactions.
- ❖ **Information:** Information is the outcome of extraction and processing activities carried out on data, and has some meaning within a specific domain. For example, to the sales manager of a retail company, the proportion of sales receipts in the amount of over 100 per week, or the number of customers holding a loyalty card who have reduced by more than 50%, the monthly amount spent in the last three months, represent meaningful pieces of information that can be extracted from raw stored data.
- ❖ **Knowledge:** Information is transformed into knowledge when it is used to make decisions. Knowledge consists of information put to work into a specific domain, enhanced by the experience and competence of decision-makers in tackling and solving complex problems. For a retail company, a sales analysis may detect that a group of customers, living in an area where a competitor has recently opened a new store, have reduced their usual amount of business. The knowledge extracted in this way will eventually lead to actions aimed at solving the problem detected, for example by introducing a new free home delivery service for the customers residing in that specific area.

3. Write about Applications of Business Intelligence.

- ❖ **Retailing:** BI can be used to forecast demand and analyse its fluctuations over time. This will help in optimizing the size of inventory in order to meet the customer demands. It will also help the companies to better understand the consumer behaviour in order to create better marketing campaigns. It also helps in enhancing relationship with suppliers.

- ❖ **Banking:** BI assists banks and financial institutions in identifying their customer base. This helps in planning their marketing strategies. It is also used by banks to deduce their performance metrics and benchmarks in order to measure the business performance. It can also help in knowledge management or learning management. It helps in management of large amounts of data.
- ❖ **FMCG:** BI provides predictive analysis to forecast demand and understand consumer behaviour. Optimization of manufacturing processes and procurement functions will lead to better relationship with suppliers. Standardization will ease the load of transaction recording and multiple source reports.
- ❖ **Automobile Industry:** BI can help in optimization of production, research, HR, distribution, marketing and finance functions by providing effective decision-making tools. It has enterprise-wide applications in all the departments.
- ❖ **Distribution and Logistics:** BI enhances communication with business partners which leads to efficient and coordinated operations. It provides intelligent reports to optimize the whole operations of the enterprise.
- ❖ **Airways:** BI removes hindrances in the ticket management system. It can be used to analyse the consumer behaviour patterns and predict future behaviour patterns in order to increase operational efficiency by improving flight management and thereby increasing sales revenue. Consumer demands can be satisfied efficiently through effective use of BI.
- ❖ **Manufacturing:** BI enhances communications with suppliers and standardizes all the transactions thereby increasing efficiency. It can help in forecasting the demand for products which helps in optimizing inventory, production and procurement size. BI implemented in HR departments can help with understanding the employee needs and difficulties, and can also be used for performance appraisal.
- ❖ **Hospitality:** BI helps organizations in the Hospitality sector to respond quickly to problematic situations. These systems help in handling problems in an efficient and timely manner. They also give companies an edge over their competitors by notifying them of new market opportunities and help them in taking advantage of it.
- ❖ **Pharmaceutical Industries:** BI assists pharma industries in research and development as well as in understanding the customer behaviour pattern. These systems also ease and enhance communication with suppliers and distributors.
- ❖ **Services:** BI systems help with people management in the services sector. In services industries, employees are a critical part of business success. Business Intelligence is used for performance management of business through benchmarking and to enhance relationship with business associates. It also helps in managing huge amounts of data within the company. BI can also be used to help in training the employees and in knowledge management.

4. Write about OLAP.

OLAP: OLAP (Online Analytical Processing) applications allow users to navigate, retrieve, and present business data efficiently. Instead of relying on manual report generation or writing complex SQL queries against relational databases, OLAP stores data in a ready-to-analyse, interactive format.

OLAP Architecture:

OLAP systems/cube Analyse data across multiple dimensions data. The architecture typically involves two primary software components:

- ❖ **OLAP Cube:** Stores multidimensional, hierarchical data extracted from a central data warehouse.
- ❖ **Access Tools:** Allow users to build, manipulate, and transform the cube data into custom analytical reports.

Understanding the OLAP Cube

- ❖ **Limitations of Tables:** Traditional 2D tables (rows and columns) struggle to represent complex, multifaceted enterprise data with multiple interacting variables.
- ❖ **Multidimensional Concept:** The OLAP Cube conceptualizes data along multiple axes (dimensions), enabling multi-perspective business analysis.

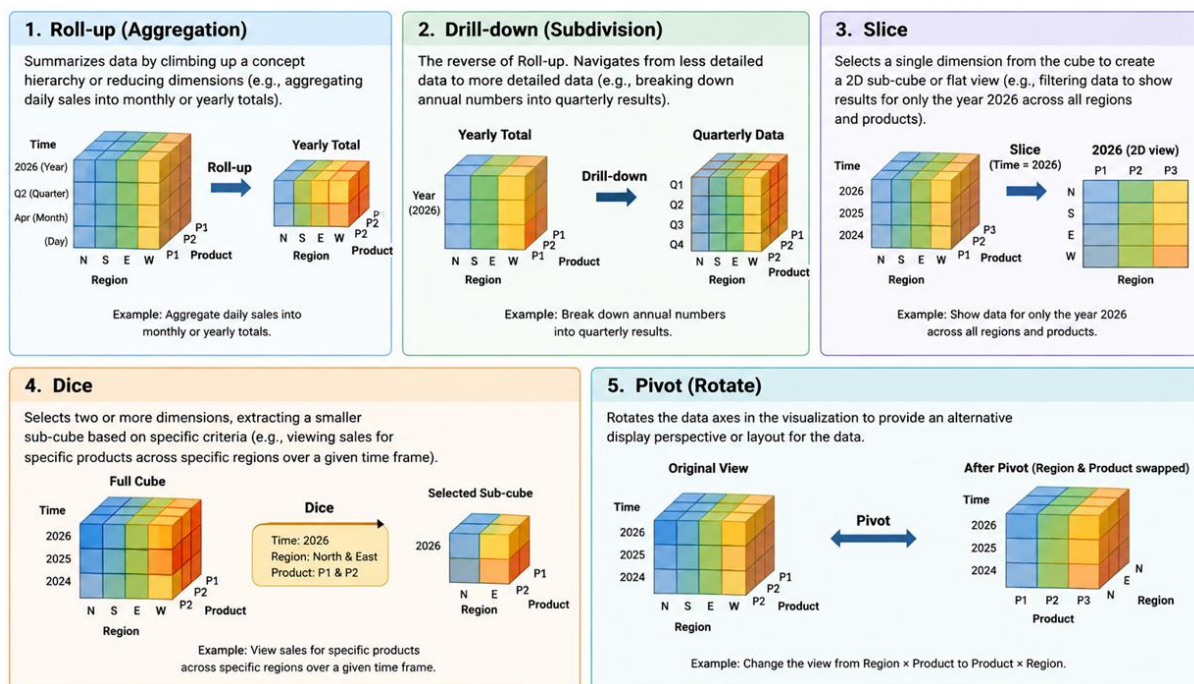
OLAP dimensions: Common dimensions are

- **Time Dimension:** Analyses data across time hierarchies (e.g., *Year → Quarter → Month → Week → Day → Hour*).
- **Geography / Region Dimension:** Tracks spatial or geographical attributes (e.g., *Country → Region/State → City → Store Location*).

- **Product Dimension:** Categorizes goods or services (e.g., *Product Line* → *Category* → *Sub-category* → *Individual Item*).

OLAP Operations: To analyse data stored within an OLAP Cube, users perform several standard operations:

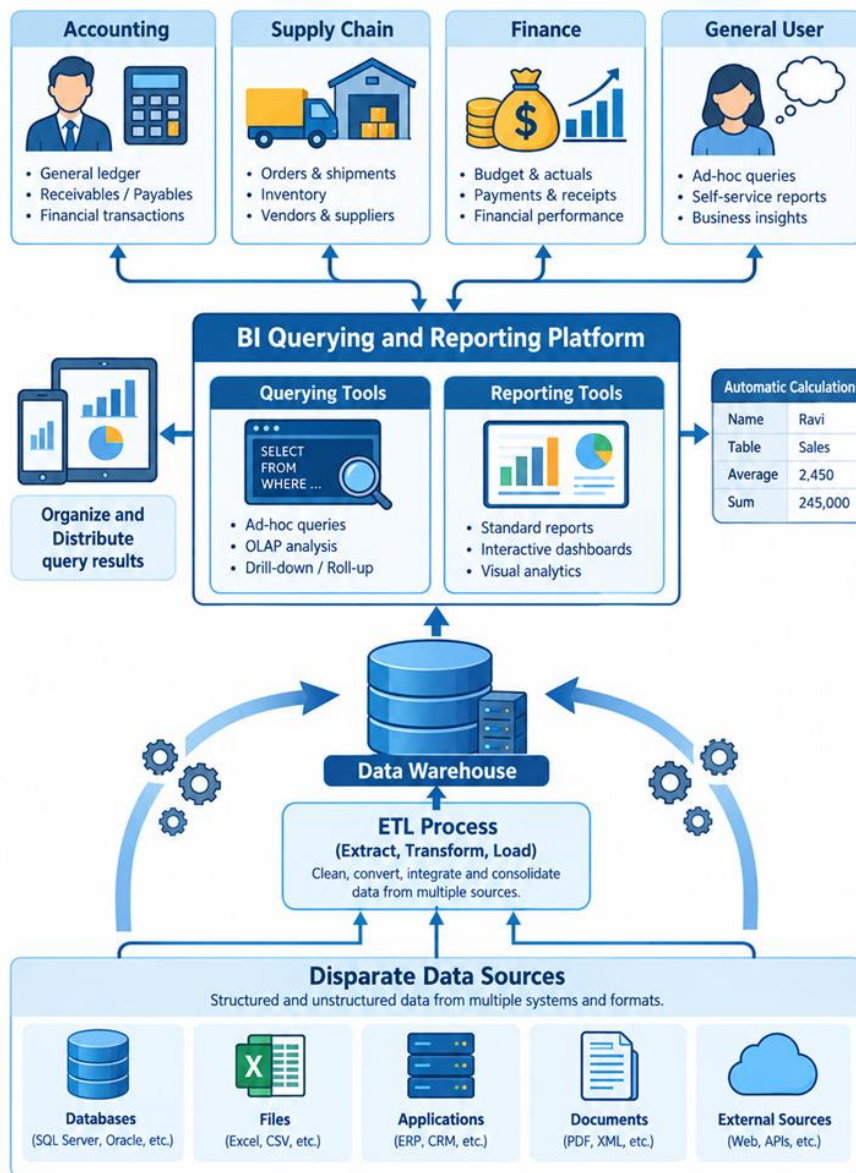
- ❖ **Roll-up (Aggregation):** Summarizes data by climbing up a concept hierarchy or reducing dimensions (e.g., aggregating daily sales into monthly or yearly totals, or combining cities into country-level statistics).
- ❖ **Drill-down (Subdivision):** The reverse of Roll-up. Navigates from summarise data to more detailed data (e.g., breaking down annual numbers into quarterly results, or viewing store-specific performance from nationwide totals).
- ❖ **Slice:** Selects a single dimension from the cube to create a 2D sub-cube or flat view (e.g., filtering data to show results for only the year 2026 across all regions and products).
- ❖ **Dice:** Selects two or more dimensions, extracting a smaller sub-cube based on specific criteria (e.g., viewing sales for specific products across specific regions over a given time frame).
- ❖ **Pivot (Rotate):** Rotates the data axes in the visualization to provide an alternative display perspective or layout for the data.



5. Explain about Querying and Building Reports with OLAP.

Querying and Reporting: A query is nothing more than an electronic request for specific information from a database. Queries are very important in database technology, data warehousing, and business intelligence, because they are the most basic link between a user and the insights contained in the database.

- **Querying tools:** Because a query itself is a request for information from a database, querying tools are designed to help a user create that request. Common querying tools provide a graphical interface to make it easy to see what data fields are available and to give the user a good insight into the metadata, how the fields are related and table structure. The latest-generation tools also offer easy-to-use drag-and-drop capabilities that allow users to adjust their queries on-the-fly as they drill down into the results that are returned.
- **Reporting tools:** Retrieving the right information from the database and presenting it in a meaningful, understandable way is a different and important task. Dedicated reporting applications are especially useful for this purpose. They are usually either bundled with, or combined with the query tools. Like the query tools, modern reporting tools offer an intuitive graphical interface that allows the user to perform calculations on the data retrieved through a query, such as averages and sums. Beyond simple presentation, reporting software helps organize and distribute query results in the form of reports.



Querying and Reporting in the BI Architecture: Disparate data sources may be spread throughout the company — across departments and range across geographical and functional divisions. The data sources are operational databases, in use by each department to record regular transactions and store data that is frequently accessed and changed. The data sources connect into the data warehouse through a set of processes commonly referred to as ETL, or Extract, Transform, and Load. These processes grab relevant data from the operational databases, then they change it into a single, unified format. After the data is clean, it is loaded into the data warehouse. Querying and reporting tools work on top of a data warehouse. They act as the abstraction layer between the user and the complex code that pulls the right data from the database and presents it to end-users in a readable format.

Users of the query and reporting tools, like the original data, can come from different departments representing diverse business functions. They can use the same query and reporting engine because that software is built to accommodate virtually any type of data, and can present it as a report that suits the needs of any users who needs to view the information

6. Explain Dashboards in BI.

The dashboard refers to presenting a user with an interactive **GUI (graphical user interface)** as a way to summarize information. **Dashboards commonly used in BI to present information visually.** The key to a dashboard's utility is the presentation and position of required data. All the necessary information should be conveyed at a glance. Before understanding the importance of dashboards, it is necessary to understand various metrics that businesses use to measure their performance. Every enterprise has a few metrics that reveal how the business is performing. These are referred as **Key Performance Indicators (or KPIs)**.

KPI: Key Performance Indicators are used to measure progress toward strategic objectives. KPIs go beyond financial measures and are true indicators of a company's operations. KPIs have to be carefully selected, irrespective of whether they appear in a dashboard application, a standard report, or some other tool. They must measure what is important to a company's success and do so in a way that summarizes

other, more granular measurements to provide a larger, more general measurement. A KPI occupies a middle ground between specific and general measurements. KPIs should be:

- Specific enough to indicate where to find the source of a problem if one exists.
- General enough to help the user

Business KPIs:

Financial metrics may indicate the overall performance of the business, but they cannot reveal the inner workings of the company. To get a better understanding of an organization's performance, business chiefs use KPIs. Business KPIs help measure success, not only of the company as a whole, but of individual processes. They are the benchmarks that encompass every operational aspect of the business, and they allow companies to manage their overall success.

Some common KPIs could be as follows:

- Average waiting time in a customer call center queue
- Number of times inventory turns over in a year
- Percentage of defective units manufactured
- Average sales' cycle time
- Sales per square foot of retail floor space

Need for BI Dashboard: Dashboards are successors of Enterprise Information Systems and Decision Support Systems with greatly improved functionality and appearance. They are linked to powerful data systems that are the backbone of modern business intelligence solutions and utilize focused KPIs. Dashboards are flexible tools that can be bent into many different shapes as the users require. They can be customized for all levels of an organization and can be set up to be backward looking. **POWER BI platform** is most suitable for organizations that already use **Microsoft products and services**.

7. Explain Scorecard & Strategy Management.

Scorecard and Strategy Management

- **Core Definition:** A **scorecard** is used to monitor and measure organizational performance. Scorecards are strategic performance management tools that compare predetermined goals against actual results (on a weekly, monthly, quarterly, or annual basis) to help organizations track performance and execute strategy.
- **Origin of Balanced Scorecard:** In 1990, Dr. Robert Kaplan and Dr. David Norton highlighted that tracking financial metrics alone is insufficient. They introduced the **Balanced Scorecard** to combine both **operational and financial measures into a unified strategic map**.

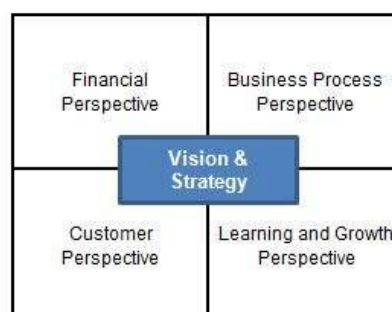
The Four Perspectives of the Balanced Scorecard

1. **Financial Perspective:** Focuses on measures like sales growth, market share, net income, cash flow, and shareholder value.
2. **Customer Perspective:** Measures aspects such as customer satisfaction, retention, brand strength, service quality, and cost.
3. **Internal Process Perspective:** Tracks operational efficiency, including productivity, cycle time, quality control, inventory, and resource allocation.
4. **Learning and Growth Perspective:** Evaluates organizational development, including employee skills, training, technology, corporate culture, and workforce satisfaction.

Deploying Balanced Scorecards with Business Intelligence (BI)

- **Manual vs. Automated:** Managing a scorecard manually is time-consuming and error-prone due to the effort required to collect, organize, and analyse data.
- **Role of BI:** BI systems automate this process by pulling raw data from enterprise systems, processing it efficiently, and transforming it into actionable, real-time insights for sound decision-making.

The following diagram depicts a Balanced Scorecard:



SUMMARY

Business Intelligence:

BI is a tool or a process used to collecting and analysing data to support business for making decisions. BI can be used to analyse customer buying behaviour.

Data, Information and Knowledge:

Data represent a structured codification of single primary entities, as well as of transactions involving two or more primary entities. **Information** is the outcome of extraction and processing activities carried out on data, and has some meaning within a specific domain. **Knowledge** consists of information put to work into a specific domain, enhanced by the experience and competence of decision-makers in tackling and solving complex problems.

Applications of Business Intelligence:

Banking, FMCG, Automobile Industry, Distribution and Logistics, Airways, Manufacturing, Hospitality, Pharmaceutical Industries & Services.

OLAP:

OLAP (**Online Analytical Processing**) applications allow users to navigate, retrieve, and present business data efficiently. **OLAP Cube** analyse data across multiple dimensions data. Common dimensions are Time Dimension, Region Dimension and Product Dimension. **OLAP Operations** are Roll-up (Aggregation), Drill-down (Subdivision), Slice, Dice, Pivot (Rotate)

Query and Reporting:

A **query** is nothing more than an electronic request for specific information from a database. **Reporting** software helps organize and distribute query results in the form of reports. Querying and reporting tools work on top of a data warehouse.

Dashboard:

The Dashboard refers to presenting a user with an interactive **GUI** (graphical user interface) as a way to summarize information. Dashboards commonly used in BI to present information visually. Every enterprise has a few metrics that reveal how the business is performing. These are referred as **Key Performance Indicators (or KPIs)**. POWER BI platform is most suitable for organizations that already use **Microsoft** products and services. POWER BI is Microsoft's enterprise Business Intelligence and data visualization platform.

Scorecard & Strategy Management:

A **scorecard** is used to monitor and measure organizational performance. Scorecards are strategic performance management tools that compare predetermined goals against actual results (on a weekly, monthly, quarterly, or annual basis). The Four Perspectives of the Balanced Scorecard are Financial Perspective, Customer Perspective, Internal Process Perspective and Learning & Growth Perspective.